

## **Integrated APT Flowmeters Provide Enhanced Flow Measurement of Natural Gas**

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### **Technical Abstract:**

The availability and cost effectiveness of natural gas make it a major source of energy. Its distribution and transportation involves many aspects of moving natural gas from producing locations to storage locations and then to end-users. Often, a system will also include hundreds of compressor stations, which move gas through the pipelines and maintain pressure in storage fields. Delivery of gas, when and where needed, requires extensive knowledge of flow rates throughout the system.

The traditional measurement of natural gas has been the orifice plate; however, the multi-port averaging pitot tube (APT) has proven an economical preference in many applications. APTs are used at many locations along the pipeline for check metering, balancing and line packing. At storage fields, the APT helps determine flow rates, leakage rates and migration rates. Within the vicinity of the compressor station, APTs are invaluable in maintaining the efficiency of turbines and maximizing equipment uptimes.

This paper discusses advantages of combining multi-port APTs, with multivariable transmitters for mass flow rate measurement of natural gas. The integration of the averaging pitot tube and the DP transmitter has reinvented flow measurement of natural gas. No longer will users have to buy a primary element and a DP transmitter separately. Instead, the primary element will come with the DP transmitter already in place, providing a single integrated solution. This combination of software, electronics and APT primary provides lower total cost and higher accuracy for mass flow measurement of natural gas.

By combining integrated electronics with insertion flowmeter technology, only one pipe hole and two wires are needed to measure all process variables. This design eliminates tubing, valves, adapter unions, transmitter mounting, excessive welding, and leak points. Installation time can be reduced by as much as 90 percent.

Enhanced APT flowmeters are capable of measuring three process variables in one device: DP, static pressure, temperature, and then dynamically compensating mass flow measurement of natural gas. Built in flow computers for dynamic compensation, integrated flowmeters eliminate the errors commonly found in non-dynamic compensated flow measurement. The result can be better than a mass flow rate accuracy of  $\pm 1.0\%$  for natural gas over an eighth to one flow turndown with compensation for variations in process temperature and pressure.

Integration of the averaging pitot tube and secondary instrumentation produces a greater overall value for every flow measurement point.